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Method and apparatus for producing information carriers in the form of cards

BACKGROUND OF THE INVENTION

~~Prior art~~

Two types of laminators which are suitable for producing plastic cards consisting of layers (laminate) by laminating, i.e. bonding together the layers, are known.

A first group works with oversized laminate layers which are placed between two heating plates and are laminated by a conventionally simultaneous action of heat and pressure. The non-defined boundaries of the finished laminate mean that in a second processing step after cooling said laminate then also has to be cut, namely punched, to the final dimensions of the card.

A second group for laminating or heat sealing suitable plastic cards comprises a hollow mold or cavity which holds the laminate to be laminated and straight away has the final dimensions of the card, and heating plates which are arranged above and below the cavity into which, as is known, cooling bodies are in turn assigned, and also pressure-exerting means which press the heating plates onto one another in such a manner that a laminate held between

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them is subjected to an appropriately dimensioned action of pressure and temperature for the short period of action.

A finished card is therefore immediately produced, the laminating always taking place until shortly before or at the softening point of the inserted material to a sufficient extent that an integral, finished card can be removed from the cavity.

Laminators of this type from the second group, as are revealed, for example, in the specifications DE 39 16 708 A1, DE 42 06 342 A1 or EU 0 669 214 A1, have a peripheral frame which bounds the receiving cavity and whose internal dimensions correspond to the final dimensions of the card thereby rendering the subsequent punching processing step superfluous. Laminators of this type which produce a finished, sized card and which are also referred to in the following as sizing laminators, generally also have a pressure-compensating body so as to ensure a uniform surface structure of the finished card and, in particular, also a uniform action of pressure during the laminating process.

However, the fact that the borders of the inserted laminate layers necessarily bear against the sized mold parts during the laminating process and therefore a loss of heat inevitably also occurs in these regions, so that although a uniform action of pressure can be spoken of, this type of heat sealing, i.e. laminating, does not succeed in also ensuring a uniform action of heat in all regions of the

inserted material which is to be laminated, may be problematical in sizing laminators of this type.

The reason for this resides in the fact that only the heating plates on both sides have final dimensions, with the result that, when viewed purely physically, said heating plates necessarily already have a certain temperature gradient from the center to the boundary regions. However, this problem could be countered by an appropriately suitable distribution of the heating means - but what cannot be rectified in this manner, particularly if the shortness of the laminating time over which the action of pressure and temperature is maintained on the inserted laminate is included, is the fact that the boundary regions of the inserted material which is to be laminated which are pressed against the lateral, sized mold parts or come to bear against the latter lose heat in this region, with the result that the uniform distribution of the acting quantities of heat which is required over the entire surface of the laminate for a uniform laminating process cannot be ensured.

This means that the laminating possibly, or even with some degree of probability, does not take place completely, especially in the boundary region of the card, with the result that the layers which are to be bonded together may be broken open again from that point, for example for forgery purposes. This circumstance can also not be countered by simply heating more intensively overall, since this leads to excessive heating of the laminate in the central region, with

the result that an undesirable fusing together of the material and possibly even of any information, data and the like which is present could occur. Such a measure would also not be conducive for inserted electronic parts.

The invention is therefore based on the object of providing a remedy for this and also of ensuring a uniform laminating process including the boundary regions of the card in such laminators which are sized by way of their mold parts.

~~Advantages of the invention.~~

The method according to the invention achieves this object by the defining features of claim 1; the object is further achieved by the defining features of claim 2. By avoiding the discharge of heat energy in the boundary regions of the cavity of the laminator or, which is synonymous therewith, by maintaining and, as it were, concentrating the heat back through the mold onto the inserted card which is to be laminated or onto the laminate, it is ensured that said mold reaches the precise softening temperature required for the laminating process in the boundary regions at the same time as in the central region. This not only results in an elegant appearance of the entire finished product over its entire surface, but also in the certainty that the layers of the laminate which are to be laminated to one another are also satisfactorily connected to one another especially in the boundary region and that when an individual layer is

inserted, the boundary region thereof obtains the same degree of lamination as the central region.

Such a result can be achieved in differing ways, for example by the mold having a peripheral, preferably also completely closed, frame made of a suitable material which conducts heat with difficulty or poorly, where the frame simultaneously forms, by means of its internal dimensions, the mold cavity for the laminate to be received. Such a frame may, for example, consist of a plastic which conducts heat poorly or very poorly, for example glass fiber reinforced epoxy resin; however, it may also have a suitable sandwich construction having an internal coating which conducts heat with difficulty, or it may consist entirely, for example, of a material, such as ceramic or other insulator material.

Appropriately designing the upper and outer heating plates to include the heat-deflecting properties of the frame of a sizing laminator of this type then enables the inserted laminate to be uniformly and completely laminated over its entire surface and therefore including its boundary regions.

BRIEF DESCRIPTION OF THE DRAWING

~~Drawing~~

The drawing shows in a cross-sectional diagram one possible construction of a laminator together with inserted card components and a heat-insulating mold frame.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

~~Description of the exemplary embodiments~~

The basic concept of the present invention resides in designing the cavity of a sizing laminator in such a manner that during the laminating process, i.e., for example, during the bonding together of a plurality of inserted card laminate layers or the laminating of an individual, thick plastic layer, the boundary regions of the card manufactured to this extent to size are able to make full use for the laminating process of the heat energy supplied to the heating plates, i.e. heat is prevented from being discharged via the boundary regions and the mold parts which are necessarily present there and are used as a bearing. For this purpose, a material which conducts heat very poorly is preferably provided for a frame forming the boundaries of the cavity, with the result that the quantity of heat which is supplied remains within the cavity and a satisfactory laminating process of the inserted material (laminate) is ensured at all locations.

In the attached drawing, the sizing laminator is denoted by 12; it comprises an upper heating plate 2 and a lower heating plate 6 which, in conjunction with a frame 7, form a cavity which is used for holding the material to be laminated.

This material to be laminated usually concerns ready-sized card layers, preferably PVC layers, for a card to be laminated, which layers form a laminate and are therefore inserted as a stack comprising the layers 3, 4 and 5 into the hollowed space of the mold, i.e. the cavity of the laminator.

It can furthermore be seen that in order to apply the required pressure in the case of the exemplary embodiment illustrated in the drawing of a laminator 12, the lower heating plate 6 corresponds with the greatest possible accuracy to the internal dimensions of the frame and therefore also to the final dimensions of the card which is to be produced, with the result that this heating plate can be inserted, from below in this case, into the cavity 7a which is formed by the hollow space of the frame 7.

Since, in order to carry out a correct laminating process, i.e. initially rapid feeding in of the required quantities of heat under pressure for the laminating process and then just as rapid dissipation of the heat so that the product which is produced can be removed in solid form from the laminator, the two heating plates 2 and 6 bear cooling bodies 1 and 8 on the side which faces away from the cavity, the lower cooling body 8 here also has approximately the dimensions of the card in order likewise to be able to be inserted into the cavity.

In the exemplary embodiment illustrated, the pressure required for the laminating process is applied via the lower heating plate 6 in conjunction with the feeding in of heat, with the result that appropriate, pressure-producing means, indicated in the drawing as a prestressing spring 9 representing all other options, act on the lower cooling body 8.

to A5 The upper cooling body 2 overlaps the frame 7 preferably on all sides by way of a lip 2a projecting all around, with the result that it rests, as it were, as a lid on the frame 7, in which case, with stationary positioning of the upper heating plate 2 together with the assigned cooling body 1, the frame 7 can be mounted in a moveable manner and is pressed by dedicated prestressing means 10 by an appropriate pressure from below against the upper heating plate 2. This firm bearing and boundary-side overlapping of the frame structure by the cooling-body lip 2a ensure that at least on the upper surface of the finished card a satisfactory, also visual attractive lamination is obtained together with a precise boundary edge for the card which is produced to size; of course, in this completed version this is not possible for the lower boundary-edge corner region of the card, since the laminating pressure has to be applied and, for this purpose, the lower heating plate 6 has to have a clearance, even if only very slight, from the inside dimensions of the frame in order to enable it to be able to be moved relative to the frame 7.

The frame 7 itself consists of a material which conducts heat only slightly or only very slightly or is provided, at least on its inner surface, i.e. on the regions facing the laminate to be laminated, with a coating which conducts heat with appropriate difficulty. For better understanding, in the graphical illustration the inserted laminate of the card which consists of the three layers 3, 4

and 5 is illustrated excessively thickly; however, in every case the material flows and fuses together, with the result that the hollow space of the mold or the cavity of the laminator is completely filled by the card material or the laminate during the laminating process.

The frame characteristics of conducting heat poorly, deflecting heat, reflecting heat and of concentrating the quantity of heat transferred from the heating bodies to the inserted laminate back onto the laminate means that during the laminating process, which is actually usually finished in seconds, there is no significant transfer of heat energy from the cavity or by the laminate material or card material to the inner sized mold wall of the frame 7, with the result that uniform heating and uniform bonding, i.e. laminating, of all of the layers of the card is ensured with a satisfactory, external appearance also being obtained.

As the drawing illustrates, in the overlapping region of the upper heating plate 2 the frame 7 can have a peripheral incision or an external recess 7b by means of which the frame mass is clearly smaller at the point where the laminating process takes place after the inserted laminate has been compressed, with the result that, for example, the heat absorption of the frame is thereby also reduced, in addition to its heat-deflecting, reflecting or heat-insulating characteristics.

However, the main reason for this reduction in material is the increase obtained by this means in the

specific pressure exerted by the prestressing means 10 between the upper heating plate and the upper frame boundary edge, which abuts from below against the heating plate, at given pressure values. Particularly good sealing of the cavity at this location and a clean, highly precise mold border are obtained in this manner. This is of importance for the fusing together of the laminate material which takes place in this region, resulting here in a clean, cut-like boundary-edge transition for the finished edge. It is therefore also recommended to grind the edge transition finely in a similar manner to a flat piston ring.

Furthermore, it may be expedient to select for the prestressing means 10 for the frame a support against the lower cooling body, since the higher the pressure which is exerted by the heating plates, the higher the frame pressure (against the upper heating plate) also has to be so as to avoid the material fusing together in the transitional boundary-edge region.